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### (54) ATOMIZING DISPENSER FOR ENDONASAL DRUG SPRAY ADMINISTRATION.

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## Description

In the pharmaceutical field specific dispensers for the endonasal atomized administration of drugs have been developed either for single use or multi-use. These containers/dispensers are to be manually actuated, by means of the user's pressing of a slider, which requires a rapid and strong action, since otherwise the spray jet is not properly atomized. This rapid and strong action is not achievable for certain patients and therefore the drug is not properly delivered and loses its effectiveness.

Furthermore for single-use dispensers, which are now very popular due to the easier determination of the number of administrations in a given time period, it has become impossible to subdivide the delivery into two administrations, one for each nostril. This subdivided delivery is the most effective and thereby the most advisable way of administering these drugs.

Therefore the administration requirements of these drugs are: The determination of the number of deliveries in a time period, the subdivided delivery of each administration into the two nostrils and a perfect atomization independent of the speed and the strength of the actuation of the dispenser by the user.

The known multi-use devices solve the double delivery problem, the single-use devices solve the determination problem but neither of the two known devices solves the problem of perfect atomization.

EP-A-0 021 123 refers to a spray applicator for fluid or powdery medicine with a container consisting of one or more dosing chambers and provided with a piston plug on one side and a spraying means with a cap on the other side. Circular beads are provided on the inner surface of the container. The piston sliding in the container has to deform one bead for moving ahead and discharge the medicine. The annular bead cannot resist a force pressing the plug into the container with a precise and predeterminable counter-force.

It is therefore the object of the invention to facilitate the use and to avoid incorrect delivery by providing a spray dispenser able to provide a drug administration with a precise energy combined with an easier activation of the atomizing device, i.e. a partially servo-assisted atomizing not completely dependent on the speed and the strength of the user's performance.

This object is achieved by the features of independent claims 1 and 6. Such a container/dispenser for drugs for the atomized endonasal administration comprises a main body operating as a slider and provided with radially extending planes serving as grips and pressers for two finger tips of the user's hand, the slider supporting on its upper part the atomizing nozzle and a piston is axially

slidable in the body with a push-stem to be pressed by the user's thumb tip.

According to an advantageous feature of the invention, said stem is formed with two different diameters and is provided with one concave bottom circular groove on each diameter.

Said body may be fitted with a depending cylindrical skirt surrounding said chamber, and said stem is fitted with a cylindrical cup shaped housing formed for sliding in said skirt.

The accompanying drawings show in different scale and by way of non-limiting examples, a basic embodiment of the article of the invention with some possible modifications. In the drawings:

- Fig. 1 is a fragmentary side, elevational and partly axial sectional view of a lower part of a container/dispenser assembly, prior to the first actuating stroke with an upper resilient detent ring abutting against the cylindrical neck of the drug container and still on its seat,
- Fig. 2 is a plane view of one of the resilient detent rings provided with a radial cut aiding elasticity,
- Fig. 3 is a view similar to Fig. 1 but after the first actuation stroke where the upper resilient detent ring has snapped out from its seat and rests against the lower one, which now acts as an end stop to the first half stroke of the piston/pump,
- Fig. 4 is a view similar to Figs. 1 and 3, but after the second and last actuation stroke, where the lower detent ring is also snapped out from its seat allowing the second half stroke to be performed with the proper servo-assisted speed,
- Fig. 5 is a view similar to Fig. 1 of a slightly modified embodiment comprising a housing/button and a slider provided with auxiliary stop elements,
- Fig. 6 is a plane view of the bottom of the embodiment shown in Fig. 5,
- Fig. 7 is a view similar to Fig. 3 of the embodiment shown in Fig. 5 showing the location of the parts at the end of the first actuating stroke, and
- Fig. 8 is a view similar to Fig. 4 of the embodiment shown in Fig. 5 after the second and last actuation stroke.

As clearly shown in Fig. 1, the container/dispenser for endonasal atomized administration substantially comprises a main body or slider 1 provided with radially extending faces serving as grips and pressers for finger actuation and with an upwardly protruding tubular cylinder supporting the atomizing nozzle (not shown) on the top thereof.

From the lower part said slider 1 protrudes downwardly forming a cylindrical neck 2 within which a cup-shaped button/housing element 3 is axially slidable, the housing 3 engaging with its bottom the lower end of a stem 4 of a piston/pump 12 which can slide axially into a liquid drug container 5.

The stem 4 of the piston/pump 12 has two different diameters, namely a larger upper one and a smaller lower one, and is provided on each of the two diameters with concave bottom circular grooves 6 and 7 which retain as seats two resilient detent rings 8 and 9.

The bottom of the upper groove 6 and therefore the central hole in the upper resilient detent ring 8 both have a diameter which is larger than the corresponding one of the groove 7 and the ring 9, and also slightly larger than the diameter of the lower part of the stem of the piston/pump 12.

The two diameters of the stem 4 are bridged by a bevel 10 which allows better snapping out of the resilient detent ring 8 and an easier assembling of the ring into the groove 6 during the manufacturing process.

The two resilient detent rings 8 and 9 are both provided with an elasticity-aiding radial cut 11 as shown in Fig. 2.

The unit comprising the piston/pump 12 and its stem 4, provided with the grooves 6 and 7 bearing the resilient detent rings 8 and 9, and the edge 13 of the container 5 constitute a servo-assisting device guaranteeing a safer and perfect atomization of the drug in two deliveries, each comprising one half of the available amount of drug.

The operation of the atomizer will be described hereinafter with particular reference to Figs. 1, 3 and 4.

In the position shown in Fig. 1 the upper resilient detent ring 8 abuts against the lower edge 13 of the container 5. When the button/housing 3 is pressed in the direction indicated by the arrow for the first drug delivery, this pressure is transmitted to the piston/pump 12 engaging with the end of its stem 4 the bottom of the button/housing 3.

In this state the movement of the piston/pump 12 is opposed by the resilient detent ring 8 abutting against the edge 13 of the container 5.

In order to obtain the first dispensation of the drug, it is necessary to exert a pressure strong enough to expand the resilient detent ring 8 and thereby to snap it out from the groove 6 so that the ring slides downwardly until it is stopped by the resilient detent ring 9 still resting in its groove 7, thus allowing the piston/pump 12 to perform the first half of its movement into the container 5 - as shown in Fig. 3 -, the created pressure being dependent on the elasticity of the resilient detent ring 8 and producing an accumulation of energy in

the user's hand, which is instantly released when the resilient detent ring 8 snaps out of the groove 6.

To obtain the second delivery, i.e. the second half of the available amount, the same operation has to be repeated.

The resilient detent ring 9 exerts the same resistance as the ring 8 in its first stage and requires again that enough energy is accumulated in the user's hand to snap it out of the groove/seat 7 as shown in fig. 4.

The instant release of the accumulated energy will again produce the best atomization not depending on the speed of depression exerted by the user on the slider 1 and the button/housing 3.

Figs. 5, 6, 7 and 8 show a modification wherein the housing/container 103 is provided with two stop-protrusions 114, and a protruding neck 102 of the slider 101 is provided with two vertical slots 115, each comprising a stop shoulder 116 as shown in Fig. 5 and 6.

All other parts and functions remain unchanged with respect to the basic embodiment.

As shown in Fig. 7, at the end of the first stroke the operation of the housing/container 103 and therefore of the piston/pump 12 is stopped by the abutting of the resilient detent ring 9 against the ring 8 and also by the detent action of the shoulders 116 against the protrusions 114 of the housing/container 103.

To cause the second stroke it is necessary to turn the housing/container 103 - as indicated by the arrows in Fig. 6 and 7 - in order to remove the obstacle created by the abutment of the shoulder 116 against the protrusion 114, and to then apply the pressure as previously described.

The modifications described herein improve the safety in the control of the first stroke and avoid any possibility of accidentally delivering the two doses within the same activation stroke.

Another embodiment of the invention has the grooves/seats retaining the resilient detent rings formed on the inner wall of the button/housing 3, according to claim 6.

It is finally to be noted that within the scope of the present invention the described device may also be designed as a one-step dispenser, said stem being provided with only one circular groove serving as a ring seat for only one resilient detent ring with a radial cut, said ring being provided on said seat for controlling the movement of the piston/pump for one-step dispensation.

#### Claims

1. An atomizing dispenser for endonasal drug spray dispensing comprising:
  - a main body (1) comprising an inner cylin-

dricial pump chamber (5) having an open end with a lower edge (13) and a bottom end provided with an opening, and a tubular part in fluid connection with said opening and fitted with an atomizing nozzle, said main body being provided with radially extending faces serving as grips and pressers;

a piston (12) slidable in said pump chamber (5), said piston being fitted with a stem (4),

said dispenser being characterized in that said stem is provided with at least one concave bottom circular groove (8) and in that one resilient detent ring (8) is disposed in each of said at least one groove (8), each of said rings having an outer diameter greater than said piston (12);

so that, when pressing said piston into said chamber, said lower edge (13) abuts against one ring (8) and it is necessary to exert enough pressure to make said ring (8) to expand and snap out from said groove (8) for having said piston (12) sliding in said chamber (5) for an activation stroke.

2. A dispenser according to claim 1, wherein said stem is provided with at least two grooves (8, 7) each containing one detent ring (8, 9), said stem having portions of different diameters, the diameters being shorter and shorter in direction from said piston toward said stem, and one groove is provided in each portion.
3. A dispenser according to any of claims 2 to 4, wherein said stem is formed with two different diameters, with one concave bottom circular groove on each diameter.
4. A dispenser according to claim 1, 2, or 3, wherein said body is fitted with a depending cylindrical skirt (2) surrounding said chamber, and said stem is fitted with a cylindrical cup shaped housing (3) formed for sliding in said skirt.
5. A dispenser according to claim 4, wherein one of said housing and said skirt is fitted with at least one stop protrusion (114), and the other of said housing and said skirt is formed with at least one axial slot (115) comprising a stop shoulder (116), so that during an activation stroke, said stop protrusion slides in said slot until it reaches the stop shoulder, thus obliging the user to intentionally rotate the housing with respect to the body to disengage the protrusion from the shoulder before to perform a further activation stroke.

6. An atomizing dispenser for endonasal drug spray dispensing comprising:

a main body (1) comprising an inner cylindrical pump chamber (5) having an open end with a lower edge (13) and a bottom end provided with an opening, and a tubular part in fluid connection with said opening and fitted with an atomizing nozzle, said main body being provided with radially extending faces serving as grips and pressers;

a piston (12) slidable in said pump chamber (5), said piston being fitted with a stem (4),

said body (1) being fitted with a depending cylindrical skirt (2) surrounding said chamber (5), and said stem (4) is fitted with a cylindrical cup shaped housing (3) formed for sliding in said skirt (2),

said dispenser being characterized in that the inner wall of said housing (3) is provided with at least one concave bottom circular groove (8) and in that one resilient detent ring (8) is disposed in each of said at least one groove (8), each of said rings (8) having an inner diameter shorter than the outer diameter of said lower edge (13);

so that, when pressing said piston into said chamber, said lower edge (13) abuts against one ring (8) and it is necessary to exert enough pressure to make said ring (8) to contract and snap out from said groove (8) for having said piston (12) sliding in said chamber (5) for an activation stroke.

#### Patentansprüche

1. Zerstäuberspender bzw. Sprühspender zum Sprühspenden von Arzneimitteln in die Nase mit:  
einem Hauptkörper (1) mit einer inneren zylindrischen Pumpkammer (5), die ein offenes Ende mit einer unteren Kante (13) und ein Bodenende hat, das mit einer Öffnung versehen ist, und einem rohrförmigen Teil, das in Fluid-Verbindung mit der Öffnung steht und mit einer Zerstäubungsdüse zusammengefügt ist, wobei der Hauptkörper mit sich radial erstreckenden Flächen versehen ist, die als Griffe und Drücker dienen;  
einem in der Pumpkammer (5) gleitbaren Kolben (12), wobei der Kolben mit einem Stiel (4) zusammengefügt ist,  
wobei der Spender dadurch gekennzeichnet ist, daß der Stiel mit mindestens einer konkaven kreisförmigen Bodenrille (8) versehen ist und dadurch, daß ein elastischer Arretierungsring (8) in jeder Rille (8) angeordnet ist, von denen zumindest eine vorhanden ist, wobei jeder der Ringe einen Außendurch-

messer hat, der größer ist als der Kolben (12), so daß, beim Hineindrücken des Kolbens in die Kammer, die untere Kante (13) gegen einen Ring (8) stößt, und es notwendig ist, einen ausreichend hohen Druck auszuüben, damit sich der Ring (8) ausdehnt und aus der Rille (6) schnappt, um den Kolben (12) für einen Aktivierungshub in der Kammer (5) gleiten zu lassen.

2. Spender nach Anspruch 1, bei dem der Stiel mit mindestens zwei Rillen (8, 7) versehen ist, die jede einen Arretierungsring (8, 9) enthalten, wobei der Stiel Abschnitte unterschiedlichen Durchmessers hat, die Durchmesser in Richtung vom Kolben auf den Stiel zu immer kleiner werden und in jedem Abschnitt eine Rille vorgesehen ist.
3. Spender nach einem der Ansprüche 2 bis 4, bei dem der Stiel mit zwei unterschiedlichen Durchmessern mit einer kreisförmigen Rille mit konkavem Boden an jedem Durchmesser ausgebildet ist.
4. Spender nach einem der Ansprüche 1, 2 oder 3, bei dem der Körper mit einer abhängenden zylindrischen Schürze (2), die die Kammer umgibt, zusammengefügt ist und der Stiel mit einem zylindrischen becherförmigen Gehäuse (3) zusammengefügt ist, das zum Gleiten in der Schürze ausgebildet ist.
5. Spender nach Anspruch 4, bei dem entweder das Gehäuse oder die Schürze mit mindestens einem Haltevorsprung (114) zusammengefügt ist, und das jeweils andere Teil, entweder das Gehäuse oder die Schürze, mit mindestens einem Ausschlitz (115) ausgebildet ist, der einen Halteabsatz (116) aufweist, so daß während eines Aktivierungshubes der Haltevorsprung in den Schlitz gleitet, bis er den Halteabsatz erreicht, und so den Verwender dazu zwingt, das Gehäuse bezüglich des Körpers willentlich zu drehen, um vor dem Durchführen eines weiteren Betätigungshubes den Vorsprung von dem Absatz zu lösen.
6. Zerstäuberspender bzw. Sprühspender zum Sprühspenden von Arzneimitteln in die Nase mit:
 

einem Hauptkörper (1) mit einer inneren zylindrischen Pumpkammer (5), die ein offenes Ende mit einer Unterkante (13) und ein Bodende hat, das mit einer Öffnung versehen ist, und einem röhrenförmigen Teil, das in Fluid-Verbindung mit der Öffnung steht und mit einer Zerstäubungsdüse zusammengefügt ist,

wobei der Hauptkörper mit sich radial erstreckenden Flächen versehen ist, die als Griffe und Drücker dienen;

einem in der Pumpkammer (5) gleitbaren Kolben (12), wobei der Kolben mit einem Stiel (4) zusammengefügt ist,

wobei der Körper (1) mit einer abhängenden zylindrischen Schürze (2) zusammengefügt ist, die die Kammer (5) umgibt, und der Stiel (4) mit einem zylindrischen becherförmigen Gehäuse (3) zusammengefügt ist, das zum Gleiten in der Schürze (2) ausgebildet ist,

wobei der Spender dadurch gekennzeichnet ist, daß die Innenwand des Gehäuses (3) mit mindestens einer konkaven kreisförmigen Bodenrille (8) versehen ist, und dadurch, daß ein elastischer Arretierungsring (8) in jeder der Rillen (8) vorgesehen ist, von denen mindestens eine vorhanden ist, wobei jeder der Ringe (8) einen Innendurchmesser hat, der kleiner ist als der Außendurchmesser der Unterkante (13);

so daß, beim Drücken des Kolbens in die Kammer, die Unterkante (13) gegen einen Ring (8) stößt, und es notwendig ist, einen ausreichend hohen Druck auszuüben, damit sich der Ring (8) zusammenzieht und aus der Rille (8) schnappt, um den Kolben (12) für einen Aktivierungshub in der Kammer (5) gleiten zu lassen.

#### Revendications

1. Distributeur atomiseur pour l'administration par voie endonasale de médicaments atomisés comprenant:

un corps principal (1) comprenant une chambre de pompage cylindrique interne (5) comportant une extrémité ouverte avec un bord inférieur (13) et une extrémité de fond munie d'une ouverture, et une partie tubulaire en liaison fluide avec ladite ouverture et munie d'une buse d'atomisation, ledit corps principal étant muni de faces s'étendant radialement et servant d'éléments de saisie et de pression;

un piston (12) pouvant coulisser dans ladite chambre de pompage (5), ledit piston étant équipé d'une tige (4),

ledit distributeur étant caractérisé en ce que ladite tige est munie d'au moins une gorge circulaire à fond concave (8) et en ce qu'une bague de positionnement élastique (8) est disposée dans chaque gorge (8), chacune desdites bagues présentant un diamètre externe supérieur à celui dudit piston (12),

de manière que lorsque l'on presse ledit piston dans ladite chambre, ledit bord inférieur

- (13) vient buter contre une bague (8) et il est nécessaire d'exercer une pression suffisante pour faire se dilater ladite bague (8) pour qu'elle se dégage élastiquement de ladite gorge (8) de manière que ledit piston (12) coulisse dans ladite chambre (5) pour une course d'activation.
2. Distributeur selon la revendication 1, dans lequel ladite tige est munie d'au moins deux gorges (6, 7), chacune contenant une bague de positionnement (8, 9), ladite tige comprenant des portions de diamètres différents, les diamètres étant de plus en plus courts dans une direction allant dudit piston en direction de ladite tige, et une gorge est prévue dans chaque portion.
3. Distributeur selon l'une quelconque des revendications 1 et 2, dans lequel ladite tige est formée avec deux diamètres différents, avec une gorge circulaire à fond concave sur chaque diamètre.
4. Distributeur selon la revendication 1, 2 ou 3, dans lequel ledit corps est muni d'une jupe cylindrique s'étendant vers le bas (2) entourant ladite chambre, et ladite tige est munie d'un logement en forme de cuvette cylindrique (3) formée pour coulisser dans ladite jupe.
5. Distributeur selon la revendication 4, dans lequel l'un des éléments formés par ledit logement et ladite jupe est muni d'au moins d'une saillie d'arrêt (114), et l'autre des éléments constitués par ledit logement et ladite jupe comprend au moins une fente axiale (115) comprenant un épaulement d'arrêt (116), de manière que pendant une course d'activation, ladite saillie d'arrêt coulisse dans ladite fente jusqu'à ce qu'elle atteigne l'épaulement d'arrêt, obligeant ainsi l'utilisateur à faire tourner intentionnellement le logement par rapport au corps pour dégager la saillie de l'épaulement avant d'effectuer une nouvelle course d'activation.
6. Distributeur atomiseur pour l'administration par voie endonasale de médicaments atomisés comprenant:
- un corps principal (1) comprenant une chambre de pompage cylindrique interne (5) comportant une extrémité ouverte avec un bord inférieur (13) et une extrémité de fond munie d'une ouverture, et une partie tubulaire en liaison fluïdique avec ladite ouverture et munie d'une buse d'atomisation, ledit corps principal étant muni de faces s'étendant radia-

lement et servant d'éléments de saisie et de pression;

un piston (12) pouvant coulisser dans ladite chambre de pompage (5), ledit piston étant équipé d'une tige (4),

ledit corps (1) étant muni d'une jupe cylindrique (2) s'étendant vers le bas et entourant ladite chambre (5), et ladite tige (4) est munie d'un logement en forme de cuvette cylindrique (3) formée pour coulisser dans ladite jupe (2),

ledit distributeur étant caractérisé en ce que la paroi interne dudit logement (3) est munie d'au moins une gorge circulaire à fond concave (6) et en ce qu'une bague de positionnement élastique (8) est disposée dans chaque gorge (6), chacune desdites bagues (8) présentant un diamètre interne plus court que le diamètre externe dudit bord inférieur (13),

de manière que lorsque l'on presse ledit piston dans ladite chambre, ledit bord inférieur (13) vienne buter contre une bague (8) et il est nécessaire d'exercer une pression suffisante pour amener ladite bague (8) à se contracter et à se dégager élastiquement de ladite gorge (6) de manière que ledit piston (12) coulisse dans ladite chambre (5) pour une course d'activation.

FIG.1

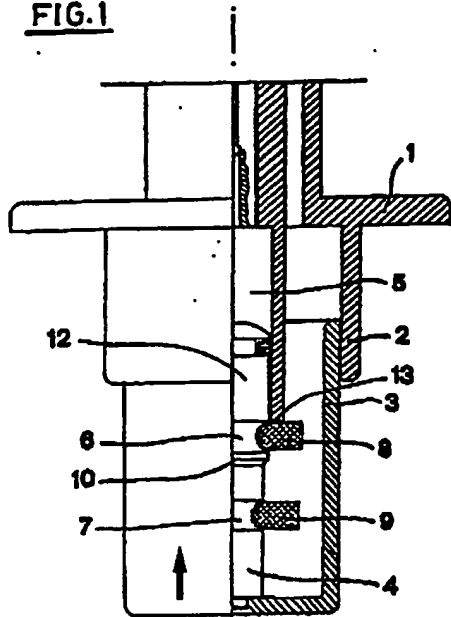


FIG.2

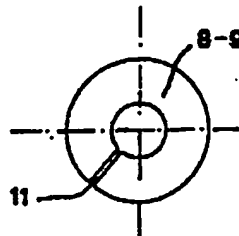


FIG.3

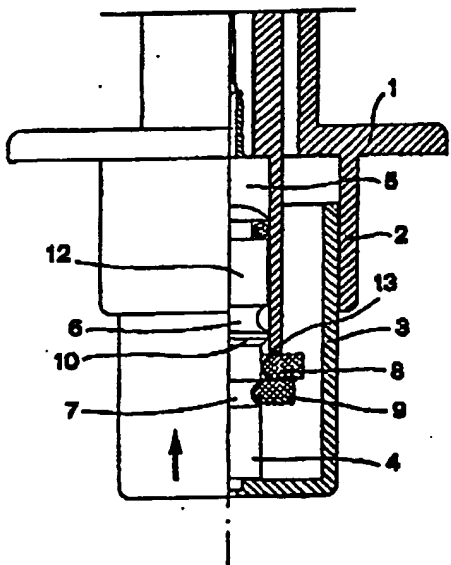
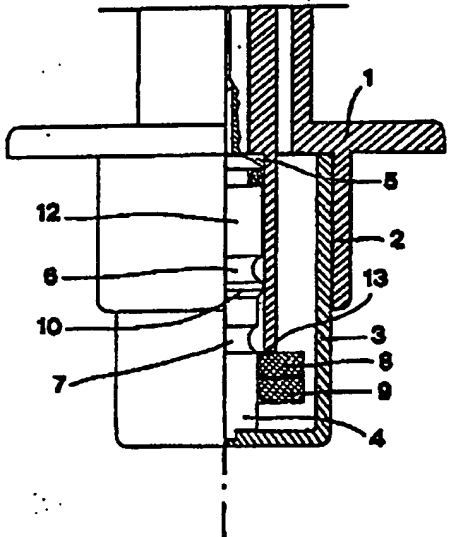
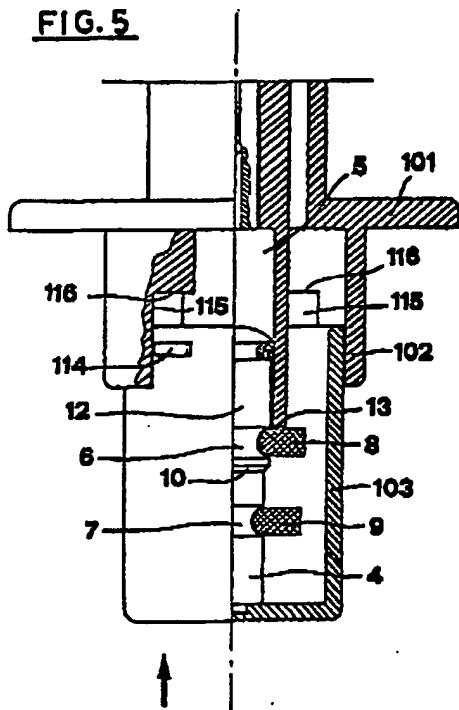


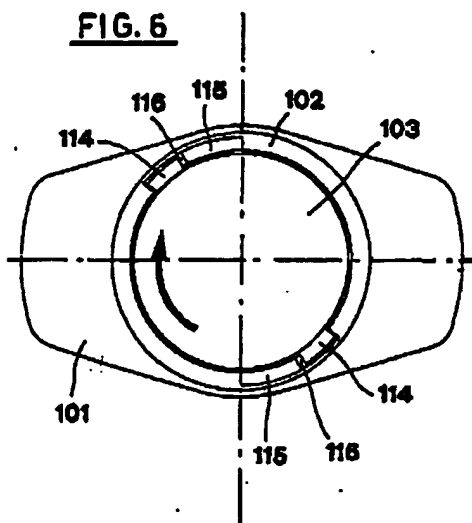
FIG.4



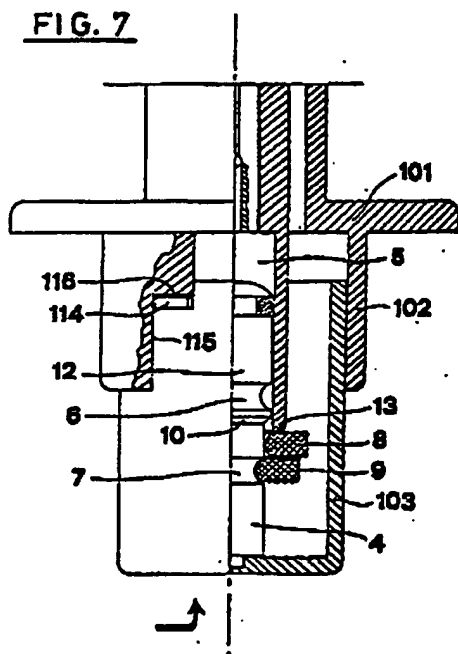
**FIG. 5**



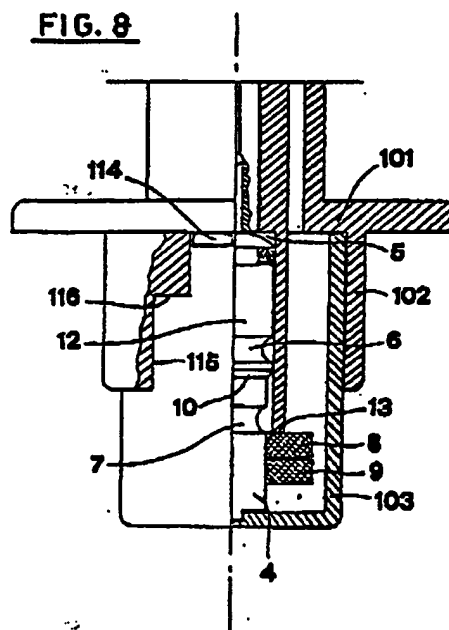
**FIG. 6**



**FIG. 7**



**FIG. 8**





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